AN ATTITUDE ASSESSMENT OF FIRST, FOURTH AND SEVENTH GRADE STUDENTS CONCERNING THE RELATIONSHIP OF SCIENCE CONTENT TO ART CONTENT

An abstract of a Thesis by
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The problem and purpose. Schools tend to implement a departmentalized system of education, but much literature, research and increasing numbers of educational models indicate the desirability of stressing interdisciplinary educational practices. Therefore, the purpose of this study is to determine whether or not children of various ages, backgrounds and intelligence see a relationship between certain elementary science and art concepts.

The procedure. The researcher selected science and art attitudes as areas of study for this paper. The response of students toward similar concepts in art and science could then be helpful in setting up curricula in these areas. Science and art were selected because these subjects are often viewed as being at opposite ends of the curriculum. Science is viewed as highly intellectual, rational, masculine and eventually for a select group of students. Art is viewed as non-intellectual, emotional, feminine, and for those who want an easy course. Science is viewed as serious work, art is viewed as play.

The questionnaire devised by the researcher dealt with those concepts and activities that are similar in art and science. The procedures used were to measure the responses and attitudes of a randomly selected group of children and teachers toward similarities of art and science concepts.

Findings. The most significant finding was that the younger the child, the more of a relationship this child saw between subjects and the world around him. The more the child progressed through the educational system, as it stands today, the less the child related his learning experiences to practical life situations.

Conclusion. Children in earlier grades see more of a positive relationship between art and science than children do in later grade levels. Cultural backgrounds seemed to effect the relationship a child perceives between subjects, but this finding was not significant.

Recommendations. A young child does perceive a positive relationship between different areas of study and this perception should be encouraged and expanded rather than slighted. Increasing efforts should be made to implement interdisciplinary approaches in teaching by local schools and state agencies.

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INTRODUCTION

In 1975 Kenneth Keniston wrote,

> Although children are whole people--full of fantasies, imagination, artistic capacities, physical grace, social inclination, cooperation, initiative, industry, love and joy--the overt and, above all, the convert structure of our system of pre-schooling and schooling largely ignores these other human potentials in order to concentrate on cultivating a narrow form of intellect.[1]

In 1934 John Dewey wrote that we need to,

> restore continuity between the refined and intensified forms of experience that are works of art and the everyday events, doings and sufferings, that are universally recognized to constitute experience.[2]

PROBLEM. Creative works depend on a student's ability to see the connections between different ideas or facts. This ability to integrate experience is present in the early grades but diminishes in the following years. What can we do to strengthen rather than diminish this ability? Aesthetic perception develops our ability to select, intensify, concentrate and order our experience.

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[1]Kenneth Keniston, "Do Americans Really Like Children?," Today's Education, 64, No. 4 (Nov.-Dec. 1975), 19.

[2]John Dewey, Art As Experience (New York: Capricorn Books 1934), p.3.

This ability is crucial for both art and ordinary life. Other questions to consider are: 1. What can aesthetic perception contribute to the rest of the curriculum? and 2. How do we interrelate art with science and other subjects?

For too long there have been misconceptions about the place of art in a school curriculum. The primary misconception seems to be that the arts are supposed to be concerned only with the imagination or creativity, while science, on the other hand, is only concerned with specific facts and discovering truth through investigations and experiments.

Traditionally science and art have been taught as separate subjects. However, literature and theoretical material indicates that an interdisciplinary approach would be better, because a child would then be able to relate what he has learned with his environment and practical life situations.

These two subjects, (science and art) need to be re-evaluated in each school curriculum to establish their individual needs relative to the whole curriculum and the needs of the children within society.

> Teachers of the sciences, practical arts, etc. tend to gravitate toward opposite poles, advocating a systematic approach to instruction, with considerable reliance on rigorously defined behavioral objectives and on educational technology. Unfortunately, both groups are often caught up in their own rhetoric and find themselves entrenched in indefensible polar positions. The artist worth his salt has his skills,

just as the capable analytical teacher has his fineness.[1]

The arts, on one extreme, are often considered a frill, feminine, or merely an easy subject. Art also is considered by some to be the domain of the genius, magical and creative, accessible to only a few.

The sciences, on the other extreme, are frequently misunderstood as masculine, academic, specialized, accessible to few, with little room for creativity, or relation to daily experience. In other words, the average student feels alienated from both subjects.

Adults, by classifying various subjects as difficult or easy, as masculine or feminine, may destroy much of a child's intellectual and creative potential. Adults often expect children to do things in an adult way, thus the child may become inhibited in his responses and afraid of not pleasing others. Children may develop a fear of making mistakes or failing to perform well. The child may become afraid to experience unknown areas. Science and art, for this reason, tend to be rather controversial subjects in the school curriculum when it comes to choosing elective subjects. As a result, they are often ignored.

PURPOSE. The researcher hopes to propose new ways of integrating subjects within a school curriculum. We need methods that not only teach facts but help the child see a purpose in his studies. We need methods that encourage

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[1]Sidney Drumheller, "An Analysis of the Artist Teacher's Performance," Educational Technology, (June 1971), 51.

the intrinsic satisfaction of learning for its own sake, not merely for the sake of pleasing others, or just completing tasks.

> For children, the central business of school is not learning, whatever this vague word means; it is getting these daily tasks done, or at least out of the way, with a minimum of effort and unpleasantness. Each task is an end in itself. The children don't care how they dispose of it. If experience has taught them that this does not work very well, they will turn ot other means, illegitimate means, that wholly defeat whatever purpose the task given may have had in mind.[1]

The broad purpose of this thesis is to encourage ways of perceiving art as an integral part of the curriculum. The specific purpose of this thesis is to analyze, in the areas of science and art, methods of implementing such a program in the school curriculum.

DEFINITION OF TERMS.

Art. Lowenfeld sees art as the process by which a child brings together diverse elements of their environment to make a more meaningful whole. By doing this the child has constructed a picture or a sculpture from which a part of (herself)himself has been given; (her)his thoughts, (her)his feelings, and how the child sees.[2] Art, to this researcher, not only agrees with Lowenfeld's interpretation of art, but more specifically means the

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[1]John Holt, How Children Fail (New York: Dell Pub. Co., 1964), 47.

[2]Viktor Lowenfeld and W. Lambert Brittain, Creative and Mental Growth, 5th ed. (London: Macmillan Co., 1970).

plastic arts, namely painting, sculpture, ceramics, multimedia or crafts. The other fine arts such as drama, music, dance and expressive writing are not included in this researcher's definition of fine arts for this thesis.

Aesthetic Perception. Aesthetic perception in this research work refers to the ability to understand with sensitivity, consciousness, and awareness, the relationships between ideas, physical entities or phenomena. Lowenfeld believes that aesthetic perception cannot be separated from creative development as a whole. Aesthetic perception develops according to person's specific need. It relates a personal idea of the work involved. It is not a separate entity, but rather a part of the total work.[1]

Interdisciplinary Education. This term deals with the interrelating of school subjects. This does not mean putting various subject areas together in one room at one time. It means, however, that ideas learned in one subject area should be carried over into other subject areas whether in the school curriculum or life experiences outside the school. Thus, what is learned in one class area could and should be used in other classes to build upon the child's learning experiences. To successfully do this, the teacher becomes an integral part of the child's

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[1] Ibid.

learning processes. The teacher is the connection between the subjects and the child's relationship to these subjects. This humanistic element, the researcher believes, is necessary for the child to connect subjects.

Attitudes. Thurstone and Chave worked with attitudinal measurements. They believed that the situation that arises or environment from which one is presently in relates to the attitude a person develops in certain situations. Thurstone and Chave, in their studies, investigated the conditions that might prevent one's true attitude to prevail and how to minimize these conditions. That is, how to readjust one's interpretations to take into account a sheltered attitude.[1] Attitudes are unconscious responses to certain situations, for example, under similar duress one individual might blush, another become angry, while still another will cry. An attitude is the way we act in response to a feeling, disposition or opinion within a specific situation. An attitudinal response to a question is broader and more personal than a factual response. Ideally an attitudinal questionnaire, because it is non-factual, ungraded and private, might reveal an accurate personal response toward an item.

Intelligence. In this research, one of the five

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[1]L. L. Thurstone and E. J. Chave, The Measurement of Attitude (Chicago: University of Chicago Press, 1929).

areas of concern was that of intelligence, (low, average or high IQ). The researcher used Low IQ as meaning any score below 90. Average IQ was considered to be between 90-100, and High IQ was over 110. For the first graders, since they had not yet had an IQ testing, the teacher's advice was sought as to how the child performed in school in relationship to the rest of the class.

Creativity. In this paper, creativity will be specifically defined as the ability to see connections between ideas and images or facts. Arthur Koestler, in his book, The Act of Creation, interprets creativity as an ability to "bisociate" the ability to solve a problem, by seeing a connection between seemingly unconnected facts or images.[1] This process is similar in both the arts and science. Creativity does not only relate to one's special talents or intelligence, but more importantly is a process of problem solving. Problem solving can either be in materials used, environment in or around oneself, or the attitudes of those involved. Creativity is sensitivity to others and one's environment. It is flexibility for new situations that may arise. It is originality or the ability to reorganize facts and elements into new ideas or shapes. Creativity is here and now within

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[1]Arthur Koestler, The Act of Creation (New York: Bell Pub. Co., 1964).

every person or thing. It is the past, the present and the future ideas and interpretations people have about the world around them.

(S)he. (S)he is a recent device to refer to both boys and girls or men and women in a text. This has been used in this work to try to eliminate any bias in sex.

NULL HYPOTHESIS. This researcher did not expect any differences to occur in the results of the survey that was taken. The questionnaire that the researcher developed, when completed by the children, was to reveal whether or not these children's attitudes were positive or negative toward an interdisciplinary understanding of science and art concepts. However, the researcher, did hope that the age level of the child would be a contributing factor to a child's attitude on interrelating subjects. The researcher also hoped to see if the school a child attended (public or parochial), the area from which the child came from (rural, urban or inner city), the sex of the child (male or female) or the intelligence (low, average or high) of the child were of any significance in a child's attitude toward interrelating school subjects (specifically science and art.).

METHOD AND PROCEDURES. The design for this study was based on a scale devised by the researcher to investi-

gate attitudes of students about interdisciplinary education applicable to the areas of science and art. (See Appendix A, page 86). Five areas of accountability or variable were used: grade level, sex, area (rural, urban or inner city), school (public or parochial) and IQ scores.

Grade Level. Three grades were used for the sampling of attitudes. The first grade was used because it was one of the first experiences in the educational system that a child has. The fourth grade was used as a transitional grade. In many schools the fourth grade is where students are confronted with departmentalization in school subjects. The seventh grade was also surveyed, since here the child is leaving the elementary grades and entering the junior high level where a more formal (departmentalized, career planning years) approach to teaching is encountered.

Sex. Both sexes (boys and girls equally) were surveyed to determine if the sex of a child contributes to the child's attitude on interrelating subjects (science and art).

Area. The area (rural, urban or inner city) a child is from was also tested to see if children from one particular area relate subjects (science and art) more

than children from a different area.

Schools. Public and parochial schools were surveyed to see if the kind of school a child attends affects his or her ability to relate to his or her school subjects to one another and to life's experiences.

Intelligence. High (110 plus), Low (below 90) and Average (90-110) intelligence was surveyed in children to see whether or not intelligence was a significant factor in a child's ability to interrelate his subjects (science and art.).

The survey forms used in this research work used the same basic items on each of the two forms. One was a science form and the other was an art form. Refer to Appendix A, page 86 for samples of the questionnaire.

After students completed the questionnaires, their teachers compared the responses to regular classroom performance in science and art. The researcher also did numerous observations of these same children regarding class performances. Personal observation, along with some verbal interaction with these children, enabled the researcher to piece together the ideas and personal thoughts of these children concerning interdisciplinary education.

This attitudinal survey was compiled on the premise that the attitudes developed by these children in

their early years will affect the choices these same children will make later in their high school or college education.

> What matters most is the teacher, the classroom environment, and a well defined curriculum which fosters inquiry. Art is the one vehicle through which children can explore their personal senses of reality. Art is the only academic area which can effectively combine other academic areas into its program and enrich each of them through doing what it does best; synthesizing and evaluating life's experiences thus providing a means whereby those experiences can be given tangible form.[1]

For interdisciplinary approaches to succeed as a part of our educational system, the teachers and staff must have open minds to interdisciplinary processes of education and do everything possible to implement such a program. Such programming should start with the very first day a child enters school since, as of the first day of school, the child has not yet learned to segregate subjects into categories. To better understand the subject of interdisciplinary education, one needs to delve into previous educational practices and theoretical positions to gain insights and perspectives. This will be undertaken in the next chapter.

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[1]Charles Stroh, "Art In The General Curriculum--A Plea For Emphasis On The Cognitive," Art Education NAEA., 27, No. 9 (Dec.1974), 21.

Chapter 2

RELATED LITERATURE

Productive thinking may take place in the mind of the most humble person, as well as the most distinguished statesman, artist or scientist. E. Paul Torrance agrees with L. L. Thurstone's statement (1952) that an act is "creative if the thinker reaches the solution in a sudden closure which necessarily implies some novelty for him."[1] Torrance further states that Stewart (1950) also agrees with Thurstone's view of productive thinking. This view was that productive thinking can occur even though the idea is not an original one.[2] In other words, it is not necessary to produce a complete new idea or product. The creative aspect is in the unique and personal insight of the individual self.

School subjects then, even though they seem diverse, have common links including that of creativity and productive thinking. The question is how does one encourage and develop creative abilities and thinking? This is where an interdisciplinary approach to teaching may enter. A child

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[1] E. Paul Torrance, Rewarding Creative Behavior (New Jersey: Prentice Hall Inc., 1965), p.3.

[2] Ibid.

using knowledge gained in one area learns to transpose it into another area. Thus the child is being exposed to a wider range of interest, and learning experiences. (S)He is encouraged to draw analogies between real life situations and academic work. In life situations one does not separate the math from the science or history from art, but one uses what is needed and available to achieve the goal.

There are several pilot programs in different sections of the country initiating interdisciplinary techniques or teaching approaches. Later in this chapter some of these programs will be described. The following pages will summarize some of the educational literature that describes the relationship between nature (science) and art.

STONE AGE TO 1850. During these centuries the relationship between nature (science) and art was more spontaneous or automatic and not necessarily conceived as involving spearate content or being departmentalized. In other words, the caveman communicated through signs and symbols his reactions or beliefs to certain environmental conditions or inexplicable happenings. The signs were often in the form of cave drawings or paintings. There were no differences between art, nature and everyday occurrences. Unconsciously the caveman was relating science

and art, art and history, communication (language arts) and religion, science and history, etc.

> Biology, which is the science of living organisms or of plant and animal life, deals with a vast and ancient subject, when this word is used in conjunction with the word drawing, two equally ancient and vast subjects are connected. In reality, biological subjects were among the first illustrations man attempted to draw. The first records of drawings are those of biologic subjects drawn by the caveman of the Stone Age (Paleolithic Period).[1]

Throughout the centuries each period of history reflected this relationship between nature (science) and art in a variety of symbolic and visual forms. Science, art, and religion maintained a mythical or magic nature. During the Renaissance, the mythical nature of this relationship began to change.

> In the Renaissance (14-16 century) art, the growing interest in nature, was at first expressed in representations of the human body and of animals and plants, later scenic landscapes. In science, it was expressed in curiosity about the hidden cause and processes of things. A related trend was humanism, the respect for human life on earth; the interest in man and his affairs including individual personalities.[2]

Leonardo da Vinci, a famous Renaissance artist, was both an accomplished artist and scientist. His drawings of armaments and anatomy are still highly prized works of fine art.

However, since the advent of modern industry and

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[1]Carl D. Clark, Illustration (It's Technique and Application to the Sciences) (Buttler, Maryland: Standard Arts Press, 1949), p.1.

[2]Tom Murco, Art Education, It's Philosophy and Psychology (New York: Liberal Arts Press, 1956) p.10.

commerce, art has been increasingly neglected and relegated to a separate realm. According to John Dewey, "it is cut off from that association with materials and aims of every other form of human effort, undergoing and achievement."[1]

Johann F. Herbart (1776-1841), a famous name in the field of education, thought that education should develop both personal character and social usefulness. Furthermore, he stated that instruction should be adapted to the past experiences and present interests of the students and that school subjects should be correlated. It was the function of the teacher to provide new and real experiences for the child. It could be said, at this time in history, interdisciplianry education was realized as a separate concept. From 1647 (Colonial Period) to the 1800's relating academic subjects happened mainly by coincidence or accident. There was no conscious theory of interrelating the school subjects within the school curriculum.

1850-1950. Between 1850-1880, Johann H. Pestalozzi was developing his system concerning the education of children. Henry Barnard, researched the work of this educational pioneer. According to Barnard, Pestalozzi

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[1]John Dewey, Art As Experience (New York: Capricorn Books, 1934), p.3.

felt it was necessary to,

> harmonize the curriculum with the natural growth of the child. He felt that children should study real objects and thus make full use of their sense impressions. His major concern was bringing about an orderly development of the child's faculties.[1]

Pestalozzi anticipated methods that are being developed today. Now, rather than insisting on rote memory, educators see the value of using one's senses and life experiences in the learning process.

In 1894, E. G. Howe emphasized the importance of child centered activities and developed many ways of directly involving children in learning. His assumption was that intellectual maturity results from subject content presented systematically and in a way that requires the child to reason. He stressed the importance of sense perception in learning and the need for a variety of examples to add meaning to science topics. He further felt that, "no subject is so profound that its central truths cannot be taught to very small children particularly if the steps are made small enough."[2]

Howe also agreed with his contemporary John Dewey. Howe summarized Dewey's ideas concerning art by stating that,

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[1]Paul Hurd and James Gallagher, New Directions in Elementary Science Teaching (Bellmont, Calif.: Wadsworth Pub. Co., 1968), p.21-22.

[2]E. G. Howe, Systematic Science Teaching (New York: D. Appleton Co., 1894), p.23.

> John Dewey brought art and everyday life together. He thought of all completed experiences, as a means of making life more coherent and vivid and he thought that aesthetic perception was merely a sharper use of the same faculties that we use for everything else. Anything thoroughly experienced could be called aesthetic, and there was no need to separate out the functions of the mind as it receives imprints either from an art object or a trip to the market.[1]

Dewey in his Emancipation Proclamation of Childhood (1897) expressed a philosophy that children should live and learn happily and well, according to their needs and interests in the present, as the best possible preparation for worthy living in the future. At that time the subjects taught in school seemed remote from the day to day experiences of the child. He felt that the school and teachers should continue the activities with which the child is already familiar. There should be continuity between the home and school. He continually emphasized the importance of art providing an opportunity to engage the whole person.

Dewey maintained that art provides a child with opportunities to encompass one's whole being and that great art,

> elicits the most vital responses and provides man with the fullest measure of experience. Experience is most realized when the emotional and sensual as well as the intellectual elements of the individual are integrated in an imaginative symbol.[2]

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[1] Howe, p.23.

[2] Irving Kaufman, Art and Education in Contemporary Culture (New York: Macmillian Co., 1966), p. 17.

Maria Montessori (1870-1952) believed that children should have freedom to proceed at their own pace in learning, choosing and directing their activities within the limits of a prepared environment. Her early work in the deficient and normal schools in Rome gained increasing attention in the U. S. Her writings first were translated and published in the United Stated in 1912.

Montessori was interested in sensory training--using one's senses to experience the things around them. She also used imaginative teaching materials to stimulate and motivate the child's learning experiences. Montessori's theories are in use today and are building blocks for future indisciplinary educational practices.

John Dewey's and Maria Montessori's material provide "bridges" from the 1800's to the present day form of education. In the 1920's the needs and interests of children became the central focus for determining the curriculum development guidelines. Nature study (science) was showing its limitations, however. There seemed to be a need for change.

One source of information about the purpose of art instruction in the 1920's is Herbert Read, who in 1958 in his book Education Through Art described art education as,

> Thirty or forty years ago (1920's), art instruction in English primary schools was much the same as it is

> in American Schools today (1958): the avid copying of objects and pictures, with every child drawing nearly identical flowers, trees, fruits, pumpkins, turkeys, Christmas trees, etc.[1]

A change occurred about the 1920's-30's when a few outstanding educators started giving the children large sheets of drawing paper and allowing them to use different materials to freely paint or draw what they wished. These results showed the general public that young children have a greater artistic potential than had ever before been realized, "and that the schools themselves, with their sterile formalization, were destroying this natural talent."[2]

In the years 1929-45, schools began consolidating subjects. Furthermore, the curricula was more directly related to life outside school. Children were directed toward nature study and the socializing aspects of the learning process.

A study done in 1947 by Mervin Oaks, and interpreted by Navarra, revealed,

> There is no evidence to support the contention that there is a definite state in a child's thinking which is characteristic of a given age. Oaks reported that types of answers to questions were influenced more by the nature of the problem, the wording of the question, the children's experimental

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[1] Herbert Read, Education Through Art (London: Faber and Faber, 1958), p.252.

[2] Ibid.

> background and vocabulary than by any mental structure for a given age.[1]

Another study conducted in 1949 by Jersold and Tasch revealed some significant conclusions about children, even though they do not mention science (or art) specifically.

> 1. There is a highly developed self interest in children's ideas about life and the world in which they live.
> 2. There is much variation in the interests from school to school and from class to class.
> 3. There is evidence that children's interests are for the most part learned.
> 4. There is an apparent discrepancy between children's interests and needs.
> 5. Adults influence greatly the interests of children.
> 6. Many children are apparently occupied in activities that are not interesting to them.
> 7. Many children are not realizing their full potential.[2]

These two studies were an important source of information concerning research into the attitudes of children and their relationship to school subjects. Even though these studies are somewhat outdated, the ideas they initiate are a valuable source of information to draw upon in order to re-evaluate present day education.

Another researcher in education, Seaborg, stated that before the middle of the 1950's, science was not

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[1]Hurd and Gallagher, p.24.

[2]Dante Vena, "Learning Out There: A Program, "Art Education--NAEA, 28, No.1 (Jan.1975), p.9.

taken seriously in the elementary schools. This was also proved by a study done by Hurd and Gallagher in 1968.

> Nature study, as an organized program, was introduced into the elementary school at the beginning of the twentieth century. The objectives of nature study were derived from a variety of educational philosophies. These objectives frequently emphasized emotional and psychological enrichment of children more than developing an understanding of science.[1]

Dante Vena in 1975 also did research back to the nineteenth century. His research concerned the study of art at this particular time.

> The values of art have always been dimly viewed by technocracy since, one cannot measure the civilizing aspects of art. At best, art has been seen (at least since the nineteenth century) as some type of fun and games enterprise and the artist as some sort of inarticulate bumbling idiot or euphemistically art has been considered as entertainment and the artist as a wild child.[2]

It appears from these two studies concerning science and art, that both were subjects looked upon dimly by society and educators of the times. As a result neither of these subjects was widely taught in the schools at that time.

1950-1970. By the 1950-1960's a "spiral approach" or vertical developmental approach to the teaching of science began. The same science concept appeared at several different grade levels, but was taught in more

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[1]Hurd and Gallagher, p.24.

[2]Dante Vena, "Learning Out There: A Program, "Art Education--NAEA, 28, No.1 (Jan.1975),p.9.

depth as the child proceeded through the educational system. There was more emphasis on doing experiments rather than merely reading a book or listening to the teacher's explanations. This spiral approach in teaching marked a new effort on the part of educators to develop the interests of children in the sciences.

However, in 1965 E. Paul Torrance noted that,

> during the past few years the national science foundation and other similar organizations have been concerned that so few women choose science careers. Generally, their investigations have led to the conclusion that women shun science careers because American society regards science work as traditionally male.[1]

Torrance pointed out that society rewards creative behavior differently for boys and girls. He conducted a study of third, fourth and fifth grade pupils in a suburban school near the Twin Cities. His questionnaire listed forty-eight different creative activities including writing a poem, story, play, song, keeping a diary, designing a model airplane, solving different problems, making decisions, making up musical compositions, games, dances, reading science literature, exploring caves, etc. He found that boys from the third grade on became more reluctant, even resistant, to writing poems, plays, keeping diaries, making up dances, etc. They were increasingly more resistant toward the arts, but in the areas of using chemistry sets, constructing and

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[1]Torrance, p.119.

designing model airplanes, making model inventions, the boys felt less restricted.

However, results for girls were reversed. Girls, at this age, often do better on verbal tests. Torrance indicated that, "creative experiencing through writing is more open to girls than to boys."[1] According to Torrance's study, girls increasingly block out such areas of experiencing as "making a recording, exploring caves, reading science magazines or books, making fire-crackers, growing crystals, making electronic motors, planning experiments, dissecting animals, etc. However, third grade girls will often engage in these activities that fifth grade girls reject.[2]

Society has often set aside different areas of creative experiencing for boys and different ones for girls. Torrance states,

> it seems clear that cultural emphasis on sex roles is a source of many conflicts for highly creative individuals and actually interferes with school learning and the full development of children's creative potential.[3]

We have been confronted with two problems which are not only the need to develop an interdisciplinary program, but also the attitudes of society which in-

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[1] Ibid.

[2] Ibid.

[3] Ibid.

fluence the kinds of creative activities that a boy or girl can choose.

David Ecker explained that science for many years was thought of and held the distinction of having to do with reason while art, on the other hand, was concerned with feelings and emotions. However, Ecker explained that as of about 1968 this notion of science and art had been rejected. Thus some progress had been made in the area of integrating science and art, at least from a theoretical point of view.

1970-75. In the last five years new theories have been developed in areas of interdisciplinary education. Specialists in the field of elementary art education have researched ideas concerning the teaching of art and how it could be made effective. Task Force Specialists in Elementary Art Education in 1972 did a study on integrated studies in a school curriculum. They stated that,

> work begun in the art room was often carried over into the classroom by the regular teacher. Example: if one group had a very low reading level and was losing interest in attempting to read, the art teacher would create a project in art which would stimulate interest and involve practice with words. A class studying fossils, but was growing disinterested, found renewed involvement in the subject by relating projects to art class. Children's awareness of texture, shapes, forms and the sensuous beauty of materials and nature can enliven the study of fossils through such art projects as rubbings, relief casting, etc.[1]

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[1] Pearl Greenberg, ec. "Art Education - Elementary," (Task Force Specialists in Elementary Art) Education Report, NAEA, (1972), p.44.

Art can regenerate interest in subjects like math, history, etc. However, art should not be used as a last resort to regenerate these subjects, but should constantly be mingled with other subjects to add flavor, interest and variety to them. This may be reversed and science, math, history, etc. can be introduced into the art class.

Through "discovery walks" into an environment, children see, feel, and observe the world around them. These walks can be a part of science and can be enhanced by the use of nature's objects in the form of art. These experiences, "can bridge the gap between child, school and environment. A gap which tends to widen continually as the child grows unless the child can find his relationship to the world around him"[1] A child needs to have a place in this world of confusion, a place (s)he can relate to, be a part of and call his or her own. School is one means by which this place is discovered. It is important that the activities and studies that are formulated in the school become a growing part of the child and help the child not only relate all that (s)he has learned but to also put this knowledge into practice in today's society.

> We have long divided the curriculum into tight, artificial components. Our separate disciplines have always demanded and taken knowledge from other

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[1] Ibid.

> areas. They do not really stand isolated and alone. One of the marks of education has been that one needs to see knowledge unified and whole. How better can we coordinate teaching and experiences of the elementary school for our young than by permeating our study of humanities with our experiences.[1]

Jeanette Wright of Des Moines, Iowa, who is an administrator of a preschool, has done research on non-mimetic drawing. Presently this material is unpublished, but does have a definite bearing on this thesis.

> In nursery school and kindergarten, children learn by seeing and handling shapes and invent their own shapes on paper or in clay by thinking through perceiving. But with the first grade of elementary school the senses begin to lose their educational status. More and more the arts are considered as training in agreeable skills; as entertainment and mental release. As the ruling disciplines stress more rigorously the study of words and numbers, their kinship with the arts is increasingly obscured, and the arts are reduced to a desirable supplement: fewer and fewer hours of the week can be spared from the study of the subjects that, in popular opinion, truly matter.[2]

Various articles have been written recently concerning this interdisciplinary approach to teaching According to an article in the New York Times, Sept. 9, 1975, there seems to be a change taking place in the teaching of science for children. The theory being expounded is to expose science to children by means of participation. Science museums and research oriented

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[1] Ibid.

[2] Jeanette Wright, "On Visual Thinking Using Non-Mimetic Drawing," Research Concerning Interrelating School Subjects, Inner Resource Workshop, Des Moines, Iowa, 1970, p.3.

institutions can and do play important educational roles today. In the past they were set apart from the actual role of science as it was taught in the school. New science centers, that are being built, are concentrating their efforts on being involved in the teaching programs of local communities and cooperate with local schools.

Some schools are trying to combine art and showmanship with exposure to basic scientific principals. Their goal is to make learning a more enjoyable experience through excitement rather than awe.

In another article in the Times, Rita Reif quotes Joel N. Bloom, director of Philadelphia's Franklin Institute, as saying, "The whole focus of learning by doing, by interacting with museum exhibits is a modern concept."[1] This involvement and participation in the learning experience ignites interest in science. By doing this, one learns that there is beauty and joy in science experiences.

Another article in the Times on September 21, 1975, by John Walsh states that,

> In many elementary schools across the country, the teaching of science has shifted from the traditional textbook and discussion approach to the 'inquiry and discovery mehtod'. Children in these schools are given simple scientific equipment and materials from the world around them, and are

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[1]Joel N. Bloom, Director of Philadelphia's Franklin Institute, cited by Rita Reif, "Both Young and Old Learn by Doing." New York Times, Sept. 9, 1975, p.L-41.

> encouraged to experiment for themselves. The educational theory is that a child learns scientific processes best by doing, rather than by merely reading a book and discussing concepts abstractly.[1]

A Community Science Seminar at MIT reported in 1975 on various new ideas concerning elementary science and its relationship to other subjects. The seminar participants watched children in action learning about simple metal objects such as nails. The children formed the nails in an open coffee can forge using charcoal as the fuel. The children pounded with hammers, while staff members rhythmically accompanied them on a small drum. A nearly finished full sized Indian hut, made of sapplings, stood in the background. Music and some practical technical principles were being implemented in a neo-tribal situation. This gave the children of these modern times a look into the ideas of the people of other times. The children learned from this experience, will use what they made, remember the making of it, realize it can be done, recall the feeling of it and with some teacher help accomplish the task of making the nails.

> Subject matter may differ, deep purpose may differ, previous preparation may be entirely different, but how people can be led to take part in work which can be science and can be art seems to me the salient lesson of our meeting. It is a serious lesson because for too long a time

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[1] John Walsh, "Children Learning About Science by Learning to Be Little Scientists," New York Times, Sept. 21, 1975.

> we have failed to provide any participating way into science for real beginners. Of course, there are distance paths to walk. After you begin, the generalizing style of science and the personal one of the arts will soon separate serious travelers. But to start out, the work in science needs to be made personal, just as the work in art needs to be given a public understandable quality. I hope to see as I have seen the artist handiwork in a science museum there for its beauty and interest. Understanding and structure are important. Who could deny it? But they lie within the material, ready at hand, once interest is aroused. Do not fear we will lose these elements by a determined effort to engage the non-specialist in something he or she can do, touch, see, enjoy and show to others.1

Through this seminar one basic point was brought about, that of subjects building upon one another to enhance the total program. Art is not art alone. Art is in history, religion or mathematics or even reading and the various other subjects one might encounter in the school program. Likewise, science is not just science alone. It is in art, history, etc. Thus subjects can and do build upon each other to make the total learning program more appropriate to everyday living.

In 1975 various government officials commented on art education and its values toward society. Some of the comments are stated below:

COMMENTS BY U.S. SENATORS.

Nelson Rockefeller, Vice President of U.S.

Art Education expands the mind. It sensitizes

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[1]Philip Morrison, Report on MIT Community Science Seminar (Cambridge, Mass.: (n.n.) (1974), p.1.

the child to new intellectual potentials. Perhaps the teaching of art, more than any other educational experience, is concerned with growth of the human potential.

When we have educated children in language skills, mathematics, science and the like, we have prepared them to live and make a living. But art education teaches the child to enjoy life, how to use the senses fully. And in so doing, the child not only adds to his or her pleasure, but begins to understand the greatest wonder of mankind, the quality which separated human life from all other forms of life, the capacity to be creative.[1]

Ted Stevens, Senator, Alaska

Rather than seeing art as an entity unrelated to everyday life, a skilled instructor can motivate the student to use art as a tool to view society in retrospect, incorporate it into a daily routine, and prepare for the future.[2]

Dale Bumpers, Senator, Arkansas

Aside from the beauty to be found in work of art, a young child can devleop self expression, self awareness, self confidence, the ability to think and reason, and perhaps most importantly realize his own unique capabilities through the many varied forms of the art medium.[3]

Dick Stone, Senator, Florida

Throughout the ages, mankind has turned to art as a medium to express the deepest thoughts and emotions of the human spirit. Into his art man has poured his sensitivity, his creativity, his insights and his inspirations. Through art he has poured his anger, his frustrations, his hurt, and his resentment. As such, artistic achievement has contributed to the uplifting of human consciousness and to the

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[1]"U.S.Senators' Comments on Importance of Art Education," Art Education, NAEA, 28, No.6 (Oct.1975),p.7.

[2]Ibid., p.8.

[3]Ibid., p.9.

nobility of the human spirit.[1]

Dick Clark, Senator, Iowa

For many children, art provides the best way of developing their own identity, finding their place in the world, and relating to society.[2]

Howard Cannon, Senator, Nevada

Art and the growing understanding of it will create a medium through which future generations may see unifying principles within the environment and thus better grasp all realms of experience.[3]

Charles H. Percy, Senator, Illinois

Art is one form of expression that can be shared by all. There is no right or wrong, no absolute formula to adhere to. It calls for initiative, imagination, resourcefulness, and being uninhibited. One should not feel the pressure of competition in art, nor feel limited or discouraged by the lack of talent.

In our society of science and advanced technology, we must still encourage development of creativity and imagination and raise art to a level of recognition that it deserves.[4]

Bob Dole, Senator, Kansas

In many curricula, art education is treated not as an adjunct to the educational routine, but as an integral part of it, and this can serve to enhance the child's whole educational experience. All children artistically talented or not--can benefit from the enrichment an awareness of art can provide.[5]

Richard S. Schweiker, Senator, Pennsylvania

The development of the total person is aided by art which can increase visual awareness and sharpen the student's observation faculties.

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[1] Ibid.

[2] Ibid.

[3] Ibid.

[4] Ibid., p.12.

[5] Ibid., p.14.

> I believe art can be an invaluable vehicle in exploring other cultures and peoples, past and present, and is a necessary component of a total educational program.[1]

Strom Thurmond, Senator, South Carolina

> A sound educational program will be concerned not only with teaching children fundamental skills, such as reading, writing, and doing arithmetic, but with encouraging them to use their imaginations. One of the best subjects for this purpose is art. Art enhances his understanding and enjoyment of his surroundings, natural and man-made. It accustoms him to judging for himself and teaches him to feel confidence in his judgments. Everyone cannot be a gteat artist, but everyone can share in the pleasures and insights which training in art invariably brings.[2]

John Tower, Senator, Texas

> It is the art teacher who can coax the creative seed in a child to full fruition, thereby giving that child a more preceptive view of the world and another mode of personal expression. It is often the art teacher who can reach a child who feels alienated from the academic world and frustrated by forces which he cannot control. In this capacity the teacher has a rare opportunity to encourage the student, to build his confidence in himself as a worthy human being, and to provide a positive outlet for his pent-up anger, thus giving the child an enriched ability to cope with his own problems.[3]

Robert T. Stafford, Senator, Vermont

> A primary function of our education system must be the effort to provide the student with the unqualified opportunity to reach full potential in all aspects of endeavor, not only in the conventional academic skills.
>
> In this effort to educate the whole person, then, we must refuse to limit the aspirations of students to the comfortable boundaries of traditional disciplines.[4]

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[1] Ibid., p.20. [2] Ibid., p.21.

[3] Ibid., p.23. [4] Ibid., p.23.

Hugh Scott, Senator, Pennsylvania

> The enjoyment of art is, in my opinion, an important part of life. Art, whether in the form of paintings, architecture, dance, literature, music, or drama, uniquely offers an insight to reality and therefore enables those who appreciate it a means of better relating to daily life. I believe, however for art to be properly enjoyed, it must be understood. That understanding and sensitivity is difficult to achieve without the necessary groundwork which should begin at the earliest educational levels. While the humanities and sciences are very important subjects for the classroom, art and aesthetic education should not be ignored; it provides the necessary balance in life.[1]

These senators see art as a necessary tool in helping the child to relate to everyday life. This attitude can lend support and develop a foundation in an interdisciplinary curriculum.

PRACTICAL IMPLICATIONS IN THE SCHOOL.

IMPACT, a new program in a limited number of elementary schools, is trying to reconstruct the educational curriculum and the child's learning environment. The guidelines for this program have been set by the EPDA (Art Education Program) under the direction of the U. S. Office of Education.

> The central focus of the instructional program will be the development of the aesthetic and effective response: the instruction of the arts, specifically music, visual arts, drama and dance as well as the more traditional area of written language will be a major thrust of the program. Stress will also be placed, however, upon discovering and exploiting instructional opportunities for

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[1] Ibid., p.19.

> aesthetic and creative learning in traditional subject matters in order to embrace the optimum humane, creative and aesthetic potential of the child.[1]

As part of the IMPACT program, teachers as well as students have a certain code of behavior that typifies their status as either student or teacher. For instance, a teacher's behavior would include such things as: working together with other teachers in the solution of problems concerning students and a better use of the time in the school day. Teachers also try to develop curricula which are based upon the needs of particular children. Teachers try to make such subjects as reading and other skill subjects more exciting so that the pupil will find them more relevant and interesting to learn. Rather than depending upon a pre-structured curriculum, teachers are responsible for learning experiences. Teachers consider themselves to be a model for the children to follow and one that will show joy in the learning processes and other facets of the school curriculum.

On the other hand, certain behavior is expected of the student. Some of these expectations are that the student should express their ideas with feeling, confidence and completeness. The students also should realize the need for the verbal and mathematical communication skills

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[1]U. S. Office of Education, "Information Announcement EPDA Arts Education Program," Guidelines for the IMPACT Program, (1970-74)(n.p.): (n.n.)(n.d.),p.1.

as part of their preparation for the future. Furthermore, they should try to become sensitive to the realtionship between things around them that relate to their work. Students should feel success in their accomplishments and comfortable with the accomplishments of other students. Finally students should be self directed, self motivated, self controlled and respectful of others.

It is the job of the regular classroom teacher to be an active participant in all class activities. The teacher should continue the work the specialist has introduced by incorporating it with other subject areas to enhance the learning processes. Children seem to be more eager, excited and enjoy the learning processes if they see their teacher partake in the activity with them. In many schools, when the specialist visits the classroom for music, art, etc., very often the regular classroom teacher leaves for a coffee break or a smoke. This is not the IMPACT way of teaching.

> The IMPACT process is flexible and flowing, rather than carefully scheduled. This permits selecting curriculum materials and teaching approaches which are appropriate to the needs of the interests of a particular class or a particular student. It also encourages the pursuit of productive independent activity.[1]

One of Columbus, Ohio's teachers describes IMPACT this way:

> We try to get everyone to realize how the arts and

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[1] Guidelines for the IMPACT Program, p.4.

> all areas of learning relate to one another. We change academic programs to include the arts and alter the art sessions to encompass the academics. Almost everything that is taught is related to and interacts with something else. Music is taught not only for its own sake, but as a part of English, Mathematics, History, Geography, Physical Education, Art, Dance and Drama.[1]

The first year IMPACT was in progress it was found that the learning environment as well as the learning that took place in that environment became more dynamic and rewarding. The people working within this environment became more alert, more responsive, more cooperative and humane with one another.

Various articles have been written about this new innovative program. In an article written originally for Music Revolution by the American Music Conference it is stated that,

> Unlike many schools, however, where students have a separate class period for music, and for art, all the arts in the IMPACT school are totally integrated. Students in art class play instruments: students in music class drew "moods" then set them to music: dance sessions will include use of tambourines or drums to establish rhythm patterns.[2]

Miss Staford, another teacher in the IMPACT school says,

> Youngsters are being tested to see if they are learning at a faster pace in IMPACT schools. We are convinced that children are doing at least as well academically as those in other schools, in addition they enjoy learning more. You can see it in the way they work together and feel it in their improved

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[1] Ibid., p.2.

[2] American Music Conference, "Making an Impact on Academics Through the Arts." Music Revolution, (n.d., 1974), p.40.

attitudes toward school.[1]

Because of the new IMPACT program, absenteeism was down and discipline was not really a problem. There seemed to be a spirit of cooperation among students and faculty alike. Children also seemed more creative and had more initiative in doing things.

Another article written by Micki Seltzer concerning IMPACT test scores, states that,

> In reading vocabulary, for example, Eastgate (IMPACT school) score went from 14 per cent (scoring at or above grade level) in 1972-73 to 79 per cent this year, 1974, an increase of 65 per cent points. Scores in arithmetic computations and arithmetic concepts were close behind going from 14-70 and from 10 to 73 respectively. Reading comprehension went from 17-58, still a 41 per cent increase, and arithmetic applications went from 14-39. "Ironically," related Evalyn Jones, Eastgate Principal, "an important factor in bringing about the change was the arts IMPACT program, a program which is not directly aimed at academic subjects such as reading and arithmetic." Jones explains that the arts IMPACT program was the key factor in bringing together staff, parents and students as a team.[2]

Still another article written about the IMPACT program by Martin F. Russell, coordinator, states that the IMPACT program in the Columbus school system being in its fifty year (1975) showed that parents liked and supported this educational approach in the schools. The parents felt that it helped to improve reading interest

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[1] Guidelines for the IMPACT Program, p.45.

[2] Micki Seltzer, "Arts IMPACT Test Scores Leap at Eastgate School Examined," (Aug.24,1970),p.10B.

and ability and that the students now participated in a wider variety of after school activities. The parents believed that the students also enjoyed learning more.

To get a better idea of how this IMPACT program worked in the Columbus, Ohio public schools, the following sequence is stated:

> The scheduled appearance of a master dance and drummer from Ghana triggered a two week African focus in the sixth grade class. The arts of Africa were investigated and students created their versions of African forms. Discussion of the influence of African art on Picasso and other early cubists led to further study of Picasso's work. Students were particularly impressed with his slab like figures and requested an opportunity to produce similar pieces themselves. Appropriate materials such as plywood and paint were provided and students became involved in this type of creative expression. Using the same materials, they subsequently moved on to more complex constructions and produced a World War I airplane. The production of the airplane motivated the students to request the drama resource teacher to assist them in writing a "Red Baron" play. The play was written and the students designed a simple but effective production. It was performed for the rest of the student body and was highly acclaimed. The IMPACT Process permits learning to flow from Africa to Picasso to Charlie Brown.[1]

Various teachers in the Columbus, Ohio schools commented favorably about the IMPACT program.

> School is interesting and stimulating and my children want to come. While they like Arts IMPACT best, they do the other work more willingly and happily. I also feel they have become more self reliant and work on their own better. This is broadening the outlook and lives of our children.[2]

> IMPACT makes teaching full of great rewards--Everyong can excel in something--All I have

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[1] Guidelines for the IMPACT Program, p.4.

[2] Ibid.

> given up to make time for the arts is the busy work--It had reached my own life and I have learned more than my students.[1]

> Tom who has a learning disability, surprised me by getting 100 on a quiz covering the Medieval period. When I commended him he replied: "Well I knew all that because we dramatized it."[2]

> The most important contribution of the IMPACT program to my class is what it has meant to the under-achievers. Many of these, who cannot function well in academic work, come alive and even in some cases, excel the others, especially in art, dance and music. They have been able to find an area in which they can function and be noticed.[3]

Other teachers comment that the IMPACT program involves every child in self expression and in doing. Even though some children are shy, they soon forget their inhibitions and become involved. The school experience, they say, tends to be more exciting and the children seem less tense than they were in a traditional environment. Children's confidence in their abilities is built up and they receive encouragement to develop other abilities that have been ignored. There seems to be a definite carry over from the academic subjects to daily life. The children, furthermore, seem less afraid to try new things. Many children tend to succeed in the arts where as before they may have done poorly academically. IMPACT is apparently a broadening experience and awakens the child to many facets in their lives academically and personally. See Appendix B for IMPACT Program Evaluation

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[1] Ibid.

[2] Ibid.

[3] Ibid.,p.1.

Guide.

WILDWOOD SCHOOL. Another program currently being developed is the Wildwood School in Aspen, Colorado. The researcher visited this school in the summer of 1975. Wildwood is an excellent example of recent research in environmental learning. Bob Lewis, director of the Wildwood School, is involved with Environmental Preschools and adapting them to different environments with the greatest emphasis being with urban situations. Given a vacant lot, old building or open field, he designs exploratory learning environments for children. Various learning nooks or centers are clustered together giving the child different sensory experiences. Four basic environments were created by Lewis: The Temporate Rain Forest, A Cave, A Desert and A Sea Coast. The child is to use his five senses to experience these environments and eventually to relate to them through some art form.

Lewis says,

> Those of us at the Wildwood School are attempting to provide a program that will enable children to acquire an environment ethic at an early age, and by example, to provide a model for other communities and school systems to do likewise.[1]

The Wildwood philosophy according to Lewis and his followers is:

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[1]Bob Lewis, Environmental Pre-Schools Adapted to the Urban Environment (Aspen, Colorado, 1975),p.2.

> With a new and constantly growing concern for the protections and improvement of man's environment, we feel that it is both timely and relevant to foster an awareness of nature and of man's place in nature at the earliest educational level; namely, the pre-school. In these formative years, when many of the most significant concepts are framed and values shaped, an environmental ethic can most easily germinate in the child's consciousness. It is the objective of the Wildwood School to help develop this environmental ehtic; an understanding of the ecological balance on this planet and the mutual interdependence of man and nature.[1]

The input of Lewis's Program is the experiencing of these different environments. The outcome is natural experiencing translated into the arts. Lewis states that,

> The five senses are the means by which we acquire experiences and information about our environment. Children should have practice in exercising acute sensory perception. It is through these inputs that they are better able to relate the sounds made by the wind, birds, waterfalls, frogs, and insects, stars, textures and odors with man made sensory phenomena that may take the form of music, sculpture, painting, poetry and dramatics.[2]

According to Lewis, schools have expected input and output to be in the same medium (subject area). Lewis, however, feels that experiences in one area like science should and could be expressed (output) in other areas such as art or math.

At the Wildwood School, children have first hand opportunities to observe nature and interact with it not only out of doors but in their learning centers. Lewis

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[1]Lewis, p.3.

[2]Ann Schmidt, "Aspen School Discussed in D.C." Denver Post, Washington Bureau, (n.d., 1975).

states that,

> Working and playing with nature will lead to awareness of its complex interrelationships which is the basis of understanding the changes in the physical and biotic environment which have been introduced by man. This understanding in turn is the indispensable prerequisite for intelligent environmental planning in later years.[1]

These two programs, IMPACT and the Wildwood School Program, have a definite bearing on this researcher's work in the field of interdisciplinary education. Both programs stress the need for children to interact with their surroundings and to relate various things they have learned within their environment or educational system. The researcher believes that if interdisciplinary approaches to teaching are implemented within the schools, the children will become healthier, more productive assets to society and will, at the same time, have a better self image of themselves.

Chapter III contains the findings of this study which relate to the material cited above.

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[1]Lewis, p.2.

Chapter 3

FINDINGS

POPULATION AND SAMPLING. The introduction and related literature sections have led to this chapter which deals with the actual study conducted and its findings. Various factors are considered in helping to explicate or clarify the data to the reader, including some statistical material.

The sampling population was that of 270 students (boys and girls) in various grade levels (1st, 4th and 7th grade) and some teachers at each grade level or area of concern (art and science). The students were randomly sampled in both public and parochial schools in rural, urban and inner city schools in Iowa and were of low, average and high intelligence. Randomly sampled in this case means that schools or children sampled were merely drawn by chance within the areas selected for this research study.

Desiring to know what children's attitudes were concerning an art and science relationship, I devised a questionnaire to survey certain concepts believed to be a common link between these two subjects. The two questionnaires are in the appendix section of this paper.

There were twenty questions on each questionnaire.

The numbering of similar concepts on each questionnaire varied. The two questionnaire were administered (to each student and to some teachers) on different days. The purpose of this was to see if, after a period of time, these children and teachers would relate the same feelings toward the art questionnaire as they had done previously on the science questionnaire.

The fourth and seventh grade students were administered the test as a group, with the researcher carefully reading the questions aloud and giving explanations when necessary. The researcher administered the questionnaire to the first grade children individually in order to clarify any questions that these children may have had. It was also theorized that, since these children had not been in school very long, their working vocabulary was still somewhat limited.

On the basis of the results of this questionnaire, the researcher was able to determine whether students and teachers would be more or less receptive to interdisciplinary concepts in art and science. The analysis of this statistical data will be presented in chapter 4.

The results of the questionnaire showed that chidlren do see a relationship between science and art concepts. Over 90% of the children had positive attitudes toward an art and science relationship. (See Frequency Count Table 3, p. 51).

The statistical methods used to analyze the results of the questionnaire are as follows: This researcher used the Analysis of Variance as a statistical tool for this paper. The Analysis of Variance concerning the five areas of research: sex, (boys and girls), area (rural, urban and inner city), intelligence (low, average and high), school (public and parochial) and grade level (1st, 4th and 7th) showed no real significant difference in their degree of relationship between science and art concepts. It was decided by the researcher to run a Pearson's Correlation (see Table 1, p.49)on the statistics to determine whether or not a positive or negative relationship occurred in the children's attitudes concerning art and science relationships within the five areas surveyed (namely: sex, area lived in, intelligence, school and grade level).

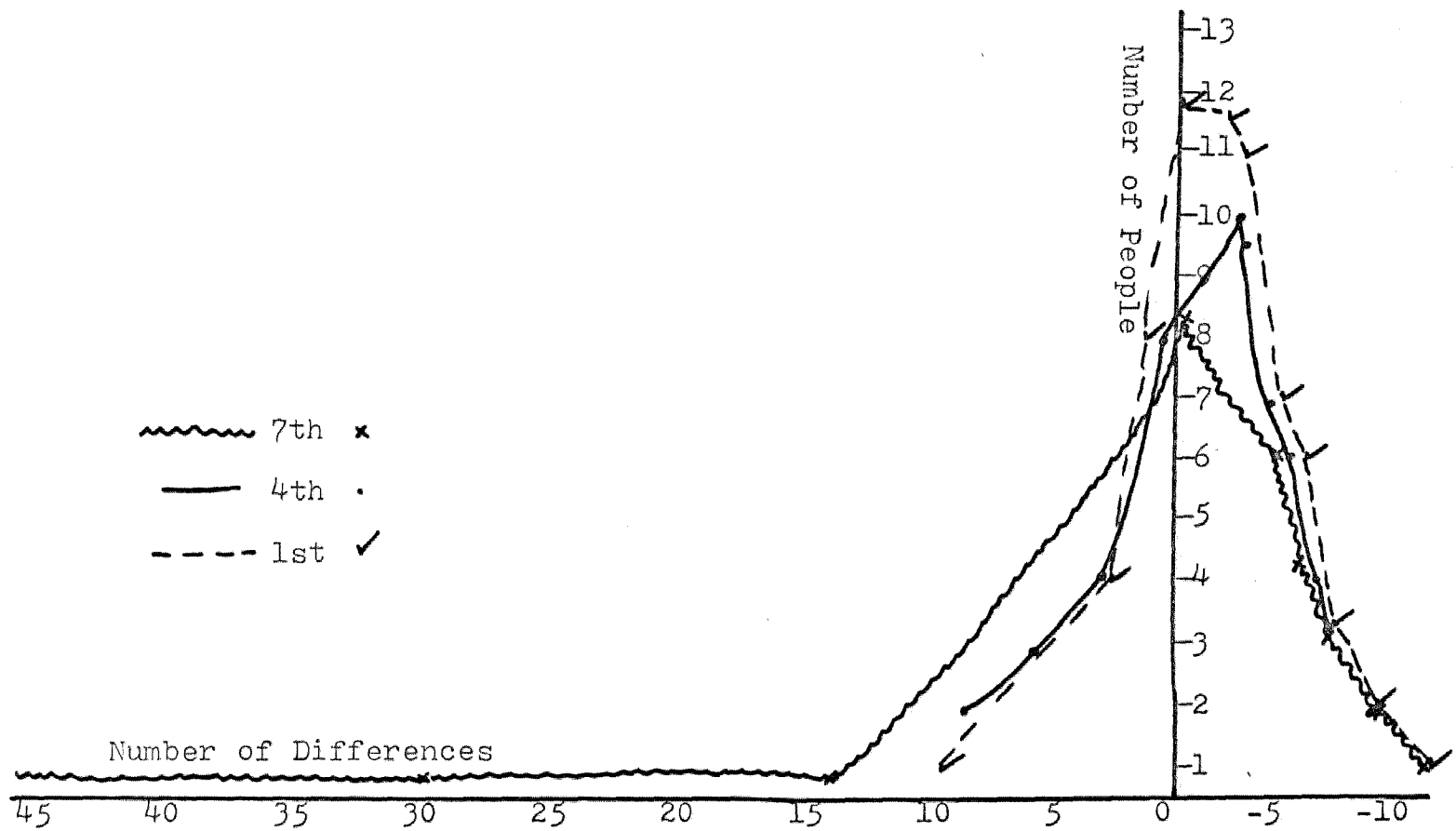
One needs to caution, however, that the difference that might occur could be due to the chance element. It is also possible that if there is no significant difference in a particular area that the sampling population was too small to really detect a significant difference. The sampling population here was that of 270 students of various grade levels (1st, 4th and 7th) and some teachers at each level, or area of concern, (science and art).

Pearson's Correlation (Table 1 p.49) shows a signifi-

cant relationship between art and science concepts in all areas of concern: sex (boys and girls), area (rural, urban and inner city), intelligence (low, average and high), school (public and parochial) and grade level (1st, 4th and 7th). One of the more interesting aspects of this Table is that of intelligence. It appears from column (r) that Low and High IQ children see more of a positive relationship between art and science than do the average IQ children. This would lead to questions as to why the middle range (average) child is different. This table shows positive relationships all the way through. Attitudes that are positive toward art are also positive toward science. All areas of concern are significant--the mean values obtained are very unlikely to be a chance relationship, since the significance column shows .000 significance. This means that the probability of a chance element is less than .001 per cent.

Graph 1

SCIENCE-ART DIFFERENCES



Graph 1 deals with differences between science and art attitudes according to grade level. It is a bell shaped curve with science attitudes minus art attitudes. A graph of art minus science was also plotted out, but the results of both were basically the same. Thus, for purposes of this thesis, the science minus the art graph alone will be used. (Refer to Graph 1, page 47).

According to this graph, it appears that 1st graders are more receptive to relating art and science concepts than either the fourth or the seventh, since this graph line is closer to the middle (mean) line for relationship of ideas. The fourth grade, however, seems to be more inclined to relate ideas (science and art concepts) than the seventh grade, but less than the first grade. In other words, the closer the line converges along the median line the more the ideas are related. The further the line spreads out the less the ideas are related. As a result, it is concluded that the older a child gets, the less the child sees a relationship between subjects.

Table 1

PEARSON'S CORRELATION

GRADE LEVEL	r	SIGNIFICANCE	NO. RESPONDING
1	.7237	.000*	90
4	.6389	.000*	90
7	.6233	.000*	90
			270 Total

AREA	r	SIGNIFICANCE	NO. RESPONDING
Rural	.7321	.000*	90
Urban	.7912	.000*	90
Inner City	.6494	.000*	90
			270 Total

SEX	r	SIGNIFICANCE	NO. RESPONDING
Male	.7203	.000*	135
Female	.7259	.000*	135
			270 Total

SCHOOL	r	SIGNIFICANCE	NO. RESPONDING
Public	.6899	.000*	135
Parochial	.7479	.000*	135
			270 Total

INTELLIGENCE	r	SIGNIFICANCE	NO. RESPONDING
Low	.7746	.000*	90
Average	.6177	.000*	90
High	.7701	.000*	90
			270 Total

* is for p (probability) which is less than .001.
r equals correlation coefficient range -1 to a plus 1.

Table 2

ANOVA FOR ATTITUDES TOWARD ART AND SCIENCE IN PUBLIC AND CATHOLIC SCHOOLS (GROUP 1 PUBLIC AND GROUP 2 CATHOLIC)

VARIABLE	NO. OF CASES	MEAN	STAND-DEVIATION	STAND-ERROR	F VALUE	2-TAIL PROB.
SCIENCE						
Group 1	135	42.4	7.3999	.637		
Group 2	135	44.169	6.138	.528	1.45*	.031
ART						
Group 1	135	41.5333	9.413	.810		
Group 2	135	44.1111	7.150	.615	1.73**	.002
DIFF						
Group 1	135	4.8963	4.884	.420		
Group 2	135	3.7259	3.028	.261	2.60***	.000

* p is less than .05
** p is less than .01
*** p is less than .001

From this table it is discerned that catholic school children have a more positive attitude toward the relationship of science and art than do the public school children. The differences in attitudes about science and art are significantly smaller for catholic school children than for public school children.

Table 3

FREQUENCY COUNT

DIFFERENCES BETWEEN ART AND SCIENCE	NO. OF PEOPLE
0	23
1	38
2	43
3	33
4	29
5	23
6	19
7	21
8	11
9	6
10	9
11	9
12	4
29	1
40	1

For each individual a count was made on the number of times that individual marked a given item in a different way, on both forms, science and art. In other words, it showed the researcher how many people answered N number of questions the same in science and art or the differences between the two subjects.

This Table (3) shows that out of 270 students that only 2 failed to see a relationship between science and art as being interrelated subjects. Thus, on these grounds, this researcher assumes that children do see a general relationship between certain science and certain art concepts irregardless of intelligence, sex, school

or geographic area. They do vary, however, according to their grade level. It appears that the further a child progresses through the educational system, the older (s)he gets, the less (s)he sees a relationship between science and art concepts.

So far one has looked at statistics involving children's attitudes concerning a relationship between science and art. However, what is the attitude of the teachers concerning a relationship between the two? The teacher is a significant influence upon the children concerning school subjects and their relationship to one another. The teacher is the connection between the child and his subjects and to some extent between the child and the world around him.

Teachers were randomly selected from three areas: science, art, and the traditional classroom teacher. Their results and comments concerning an interdisciplinary approach to teaching science and art are listed here.

ART. One art teacher's attitude concerning a possible art and science relationship was positive, the other art teacher was all positive except for one concept. This concept related to demonstrating about things found. No reason was given for this one negative response. One of the art teachers commented,

> Science and art do ride side by side to a degree, the accidents that occur in both are major influences

in both areas of development.[1]

SCIENCE. Two science teachers also were surveyed about their attitudes toward art and science relationships. Both of them had positive attitudes in all areas of concern on the questionnaire. One science teacher commented that,

> The maturity of the students would aid in the approach and experiments the class would do in science.[2]

This may be true when speaking only of science, but when trying to relate science and art it depends on the age of the children. It is generally accepted that with age one obtains maturity. If this is true, then the younger the child, the less mature (s)he would be. However, according to this researcher's date, the younger the child, the more sophisticated is the ability to interrelate learning experiences. This same teacher also rationalized some of the possible answers children gave to the questionnaire as,

> Some of the things that seem exciting would and could be curtailed by the class one has, in knowledge, practice and discipline.[3]

The other science teacher was very excited about

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[1]Art Teacher from King Elementary School in Des Mones, Iowa, 1975.

[2]Science Teacher from St. Joseph Elementary School in Cresco, Iowa, 1975.

[3]Ibid.

the questionnaire and profusely related this through her comments. This teacher felt that the science questionnaire was,

> exciting, because all these concepts are fun and interesting to do. Some are less exciting to teach because of limited science facilities or because of difficulty in keeping the interest of the students.[1]

The same science teacher stated that she saw many relationships between science and art. This teacher also stated to the researcher,

> Do continue your explorations between the two areas (science and art). Your interest has increased mine for doing the same. I might try a mini course for next year (1975-76) called Art in Science.[2]

This teacher also stated that the science questionnaire would be exciting to do especially if they were correlated with art projects.

Four other teachers were randomly selected from 1st, 4th and 7th grades in various schools surveyed. Very few negative responses were noted concerning the relationship of art and science to one another. The negative responses were in the areas of shapes, watching things, telling about things and background information.

One seventh grade teacher remarked,

> (It's a) good idea (to relate science and art) but often it is difficult to keep pupils on what they

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[1] Science Teacher from St. Theresa's Elementary School in Des Moines, Iowa 1975.

[2] Ibid.

> are doing. Their minds wander. Excellent for pupils to explore and examine things on hand.[1]

This same teacher also related science and art concepts to certain other areas like math, english and social studies.

Finally she stated that,

> In general, I would say that most pupils are very interested in science because they are interested in doing. Art is more doing your own thing and pupils love to use things that are different shapes in their experimenting.[2]

This teacher also related a feeling of excitement to the research being done in relating science and art concepts.

One teacher did not notice that both questionnaires (science and art) were the same. She remarked that,

> I like this test and truly believe in science or anything that involves the above things.[3]

Then on the art questionnaire, which had precisely the same questions on it only in a different order than the science questionnaire, this same teacher remareked that,

> To me the science quiz is more alive than the art quiz.[4]

Ramifications of such an attitude will be covered in the next chapter.

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[1]Seventh Grade Teacher from St. Theresa's Elementary School in Des Moines, Iowa 1975.

[2]Ibid.

[3]First Grade Teacher from King Elementary School in Des Moines, Iowa 1975.

[4]First Grade Teacher from St. Joseph Elementary School in Cresco, Iowa, 1975.

Another first grade teacher responded very positively to the questionnaire and stated that,

> For small children, I feel art is necessary in every subject area as much of the young child's self expression comes from his creation. A variety of media for art should be used so that children can experience art in many forms, in other words: clay, paint, paper, different objects, etc. I feel it is important that children have opportunities open to them all the time to use these different medias--not just using them once during an art period. In other words: paints, clay, etc. can and should be available for their use during free time.[1]

Presenting a variety of techniques, depending on the age level of the child, can help the child develop his own particular style. This will help him develop greater creativity, (seeing there are many ways to work out an idea).

Generally speaking, responses from the children and teachers were very favorable. Of the teachers, six out of eight surveyed were very interested in this research work. The other two were not as excited about this research and it obviously showed in their results.

In the next chapter, a brief summary will be followed by analysis and conclusions about this study as well as various recommendations.

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[1] Ibid.

Chapter 4

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

SUMMARY. The previous chapters surveyed some of the background information leading to interdisciplinary educational approaches. New insights were gained into the attitudes of some children and teachers of various grade levels on the possibilities of interrelating science and art within a school curriculum. Literature, theory, and research concerning this relatively new concept of interdisciplinary educational practices increasingly has appeared in recent years. However, little has been done nationally to implement such an educational program. Children do see a relationship between subjects when they first enter our educational system. It is only after they have been within the system that they start to separate various areas of learning. Education is a part of our daily life, not only during childhood, but also as an adult. Life is not just one experience, but many different experiences which are intertwined with one another. Education, however, tends to separate these experiences and tries to categorize them. Thus the connections between one experience and others is avoided and quite often forgotten.

For example, when a child first enters school, there is usually an art specialist, music specialist, P. E. Specialist and even a reading specialist. By the time the child is in the fourth grade or junior high school (s)he is traveling from room to room and from teacher to teacher for different subjects. Each teacher teaches his or her own specialty. This specialization increases as the child progresses through school and college.

> Too often within the school learning program, experiences are isolated. At 9:27 the arithmetic books come out, at 10:14 it is time for recess, at 10:23 the music teacher arrives, at 11:05 it is social studies time. This fragmentation of the learning process into isolated segments creates an artificial situation. A child does not grow in single subject areas, nor does each area remain isolated in life outside the school. This early specialization has isolated some of the subject matter areas from life to such a degree that the subjects have lost contact with society. We can even see this at the upper levels of education, where there is great discrepancy between social and scientific achievement.[1]

The school must accept responsibility for specialization which detracts from the interrelation of subjects. So too the attitude of the teachers involved within the educational system can detract the child from interrelating subjects. It is the teachers who are responsible for interrelating the things a child learns in school about

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[1]Viktor Lowenfeld and W. L. Brittain, Creative and Mental Growth (5th ed.; London: Macmillan Co., 1970), p.73.

life's experiences. If they themselves do not see the relationship, then how is the child going to be able to see the relationship?

On the questionnaire given to the children, it showed that the younger the child, the more that child saw a relationship between the things he learned. However, by using the same questionnaire on some of these children's teachers, it showed whether or not the teachers of these children saw a realtionship between subjects (science and art). Children having this teacher to instruct them could more easily have positive relationships between these subjects destroyed.

Another teacher had a negative response to science and art in the areas of shapes, watching things, telling about things and background information about the subject.

Generally speaking, most children and teachers do see a relationship between science and art. This is not noticeably affected either by the child's sex, area they come from (rural, urban or inner city), school (public or parochial) or intelligence (low, average or high). However, the younger child seems to relate more easily to this relationship between science and art.

CONCLUSIONS. The researcher chose to try to relate science and art since they often appear to be at the opposite ends of the school spectrum. Art seems to be

deleted quite often as a nonimportant frill, playtime activity or an activity requiring little, if any, intelligence. Furthermore, art has limited appeal, since it often has been considered a feminine activity. Science, at the other end, seems to be only for a chosen few, since it seems more sophisticated or complicated. In many elementary schools, it too seems to be a subject rarely taught all of the time, but taught when there is time for it or it is meshed together with social studies. Furthermore, it is often seen by girls as a "masculine" activity. It is necessary that art and science be made a creative activity instead of one that is at the opposite poles of the school curriculum.

By using interdisciplinary approaches to teaching, better understanding can be gained not only about the U.S. and its cultures, but also the whole world and its various civilizations. The uniqueness of this approach lies in the way in which the arts are used as a focal point for interrelating civilizations separated by time and distance.

In 1959 the American Association of School Administrators stated,

> We believe in a well-balanced school curriculum in which music, drama, painting, poetry, sculpture, architecture, and the like are included side by side with other important subjects such as mathematics, history, and science. It is important that pupils, as a part of general education, learn to appreciate, to understand, to create, and to criticize with discrimination those products of the mind, the voice, the hand and the body which give dignity to the person

and exalt the spirit of man.[1]

We have not, however, realized this goal. As recently as 1970, Charles Silberman points out with irony and dismay that,

> Most schools give their students a powerful and effective esthetic education: they teach them that interest in the arts is effeminate or effite, that study of the arts is a frill, and that music, art, beauty, and sensitivity are specialized phenomena that bear no relation to any other aspect of the curricula or of life.[2]

He further says,

> It is not possible to spend any prolonged period visiting public school classrooms without being appalled by the mutilation visible everywhere--mutilation of spontaneity, of joys in learning, of pleasure in creating, of sense of self.[3]

Joy in learning and pleasure in creating are the foundation upon which one builds the child's learning experiences. Interdisciplinary approaches to teaching are advocated by a diversity of literature internal to the field of education. This researcher feels that all school children, no matter their sex, intelligence, talents,

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[1]National Association for Humanities, "American Association of School Administrators, "Guidelines Preparation of Humanities Teachers K-12 (Kirksville, Missouri: (n.n.) 1959).

[2]Charles Silberman, Crisis in the Classroom (New York: Random House, 1970), p.183.

[3]Ibid., p.10.

or handicaps, will be better able to connect their learning areas with an interdisciplinary approach and thus be more successful in and out of the school situation.

The date for this study and related readings in the previous chapters reinforce the validity of initiating and implementing an interdisciplinary curriculum. This strategy needs to be adatped to each individual school although there is no general rule that can fit every situation. The curriculum of each school must be re-evaluated according to the needs of the children, the community and society and then implemented accordingly.

RECOMMENDED APPROACHES TO INTERDISCIPLINARY TEACHING. To develop a program that meets the child's needs in the school system, the first consideration is the child's attitude.

The attitudes a child develops in early life will ultimately determine the choices (s)he makes later on in life or in school. Trying to measure these attitudes is difficult and not often attempted.

Tests and personal observations by teachers and peers can determine, to a certain extent, a child's feelings or attitudes about things.

> Although it is widely recognized that standardized test results are merely one means of gathering information, and that test results are not as reliable as need be to enable accurate prognostication, still these test results are a partial means of assisting in the determination of school wide, class wide and

individual needs.[1]

Determining these needs will help in setting up the areas of study or experience needed for each individual child. However, tests alone should not determine this. Teacher observations, consultations with parents and an assessment of the general environment from which the child comes all need to be considered. The peer group also has a very strong influence upon the child and his habits. The peer group plays a vital role in the child's educational development and his attitudes toward school and life in general.

Attitudes and changing attitudes are the means by which integrated educational programs can be implemented into the child's life. An open minded child who enjoys the learning experiences is a child who is more likely to see a relationship between subject areas and the world about him. However, if a child hates school and everything associated with it, this child is not seeing a relationship between various subject areas and life.

The Necessity For Integrating Experiences. A child's mental growth depends upon a rich and varied relationship between the child and his environment. This relationship is an ingredient in the creative experience.

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[1]Silberman, p. 114.

A child learns by means of his senses. The ability to see, feel, hear, tough, and smell, play an important role in the development of the child within his environment. When this interaction takes place, it forms the background of experiencing necessary for the child to become a creative and intellectual person within society. These experiences also can have an effect upon the child's total development and can be the basis for the child's attitude toward life itself.

The researcher believes the best way for meaningful integration to occur in school subjects is by relating them to art.

Art, for the child, is more than a pasttime; it is a meaningful experience by which (s)he communicates feelings and ideas with the self and others. Art can help children with the development of their thinking processes as well as their perceptual development, emoitional development, social awareness and creative abilities.

> Man displays his creative powers through art. Nature displays hers through evolution. The two are intertwined and reciprocal. For art changes man and man changes art.[1]

By using art as the fulcrum for this interdisciplinary approach to teaching, the potential for relating other subjects to the total curriculum will be realized.

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[1]David Mandel, Changing Art, Changing Man (New York: Horizon Press, 1967), p.12.

One of the strongest connections between art and science is the exercise of similar intellectual patterns of observation, exploration, discovery.

> Intellectually the schools have regarded the arts as entertaining rather than as a fundamental of human understanding. Until the last decade, the creative and artistic efforts of most chidlren were encouraged and rewarded until they reached a certain age, early in their schooling, when it was time to "get serious". The adult would then begin demanding preparation for a job, and an end to play and fun.[1]

> Although few people today claim to be scientific experts, many believe in the value of advanced scientific experimentation. At the same time, most people claim to know what they like in art and doubt the value of new experimental art forms. It seems strange to realize that one segment of our society is given approval, but another segment condemned for their investigations.[2]

> Art is the only academic area which can effectively combine other academic areas into its program and enrich each of them through doing what art does best; synthesizing and evaluating life's experiences to be given a tangible form.[3]

With interaction between the various arts, other subjects and activities, false distinctions between work and play will cease. For example, both science and art will equally share in the work and the play aspect of

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[1]George Kneller, The Art and Science of Creativity (New York: Holt, Rinehart and Winston Inc., 1967), p.8.

[2]Lowenfeld and Brittain, p.18.

[3]Charles Stroh, "Art In The General Curriculum--A Plea for Emphasis on the Cognitive," Art Education NAEA, 27, No. 9 (Dec. 1974), 21.

learning. There should be interaction between the arts and the sciences, between thought and feeling. Each subject can benefit from the other.

> Education should prepare the people not just to earn a living, but live a life--a creative life, humane and sensitive.[1]

> Art, learning and life are intertwined and inseparable. In the school curriculum, art is the one subject in which all others meet, for in the art class each child exercises his total understanding, awareness and imagination and creativity. Too, through art he learns to see and appreciate the world around him more fully. In teaching art, the aim should be to lead each child to realize that art as the vital link between him and his environment. Art helps him to see, to become sensitive to, to understand, to care about his world. It helps him to relate to his world and to express himself about it.[2]

Curricula Strategies. In an integrated learning experience, the child is encouraged to learn well a specific skill but to also see connections between a skill and other areas of learning. Integrated experiences can help in nullifying the segregations of school subjects that seem to be present in today's schools. Instead of having math class completely segregated from other subjects, one can work math into whatever subject one is teaching. If the class is building a set for a play, measuring for this could involve a study in geometry. Furthermore, geometric shapes

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[1]Silberman, p.114.

[2]Arnel Pattemore, Art and Environment: An Art Resource for Teachers (New York: Van Nostrand Reinhold Co., 1974), p.139.

and designs could be incorporated into the set designs and so forth. In other words, math concepts can be taught in drama class, in art class, in science class, etc.

By further integration of these subjects, each child will find their own particular area of interest to pursue. Whether it be drawing terrains, etc. (art) for a geography class or calculating the diameter of the earth (math) for a science class. The child, as artist, responds to a tree in a certain way only when he is aware of certain facts about this tree. In other words, a person needs to really know a thing before (s)he can fully experience it. Thus an artist would look at the scientific aspect of a tree, composition, texture, anatomy etc., in order to truly experience it. Elementary school rooms need to become laboratories where children can experience, interact and experiment in all subjects to more fully understand the world around them.

Unfortunately, for this to be done, one of the most detrimental objects for a good educational setting needs to be eliminated--the clock. School seems to be a place where everything is controlled by the clock. Students may want to work in a certain area but can't because it is not time for that subject. A rigid adherence to the clock means that some activities may begin before interest is aroused and may end before interest disappears. Also lessons may end in a certain skill area before the child has completely mastered

it, just because it is time to end. Many children may do poorly in school because of the emphasis upon short time blocks.

Children often have a favorite area of study in school. But all too often this naturally appealing subject becomes disliked by the children because of the way the child and the subject are brought together in the school's educational system. It may be neither the child's fault nor the subject's fault. It is our educational system, as it stands in many schools today. Analogies are not encouraged always between what a child learns at home and his subjects in school.

> As the number of specialists in a school curriculum multiplies, the specialist-pupil contacts are increased so that it becomes more and more difficult for the specialist to develop an intimate rapport with anyone. If a ceiling is placed upon the teacher-pupil ratio within a school, and if the intimate relationship between teacher and pupil is to be maintained, the number of specialists must be kept to a minimum. The teacher is the human element in the system. The teacher, knowing the children and the system, is, in a sense, their legal counsel as well as an understanding judge who can continually adapt the system to the individuals.[1]

Subjects do not grow as separate entities. The child, before entering school, does not separate things (s)he has learned into categories. (S)he only learns to separate these things when (s)he enters school. Each subject builds upon each and every other one. To love art

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[1]Sidney Drumheller, "Educational Technology's Humanistic Teacher." Educational Technology, (Jan. 1972), p.46.

it is helpful to understand literature, and to know and love literature it is helpful to know and appreciate the theatre, and to experience the theatre to its fullest one must be acquainted with dance and this goes on and on for each subject.

Specialization can be important, but so too is the acknowledgment of relationships between subjects. Wright states that,

> It is my observation that most teachers are trained to teach some specialty, for most of the day the student listens to what different teachers know about their specialties. But who is making the connections between this teacher's specialty and that teacher's specialty? It does not appear that the connections are being automatically made by the student. I suggest that the arts, appropriately used, can serve as a vehicle for meeting this need because the arts are the most powerful resource we have for integrating and assimilating human knowledge. The arts are, in fact, an integrating experience and can heal the split that still exists between perception and thinking. When knowledge is integrated, creative intelligence is more likely to be exercised.[1]

For this integration to occur within the individual, the teacher needs to guide the child in this direction. Without this guidance, integration may not occur. The child alone may not be able to make the necessary connectons. The child is influenced by his emotions, his sensory experiences, and the environment around him.

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[1]Jeanette Wright, "On Visual Thinking Using Non-Mimetic Drawing," Research Concerning Interrelating School Subjects, Inner Resource Workshop, Des Moines, Iowa, 1970, p.3.

If this child can become involved totally with the learning process, (s)he will be a part of the integrating process and eventually take the initiative to see the connections unobserved even by the teacher.

> Meaningful integration occurs in the youngster through such a motivation in which an atmosphere is created that is conducive to self identification or self involvement. Art can be the core of the learning environment within the school. Integration does not happen by merely shuffling subject matter around--such integration can take place only through the child himself.[1]

A Skills Diagram.

> In both science and art, the individual searches and sensitizes himself through study and investigation of the phenomena observed, and absorbs himself in the essence of the thing. In both, he records those observations, draws tentative conclusions, and applies them to the better solution of current problems and future imagined needs. Such similarities between these two disciplines constitute the reason for proposing an interrelated experience of art and science as the basic core of the total public school curriculum, from kindergarten through the 12th grade.[2]

It appears that, in the past, science seemed to be an academic subject and art a magical subject, often misunderstood. The researcher recommends that art and science, in particular, can be and should be integrated within one's school curriculum. One way of doing this

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[1] Lowenfeld and Brittain, p.75.

[2] Richard Wiggen, "Art and Science Core," Art Education NAEA, 22, No.7(Oct. 1969),19.

could be as follows:

The Context theme of what is to be taught.	This Context, for example, might deal with the subject of caves in general.
The Content What will be taught under that particular theme.	The Content then would deal with various subjects that are related to the study of caves. For example (Skills).
The Skills How that subject will be taught.	

Skills

MATH	SCIENCE	LANG.ARTS	ART	MUSIC	P.E.
Form, shape size	Color Composi- tion Materials	Communica- tions (old Pictures) Symbols	Color Texture Space Signs History Drawings Symbols	Symbolism Materials for instr- uments History	Balance
SOCIAL ASPECT	SOC.STUDIES				
Purpose of Cave	History Symbolism				

The skills diagram on this page shows that for every art skill there is a corresponding skill in other areas of study. This one example (the study of caves) demonstrates the use of art skills in other subject areas.

In planning an interdisciplinary approach to teaching, six areas must be considered: Subject matter, methods of approach, materials, time allotted, and the roles of the student and teacher. Each child has different oppor-

tunities available to him, levels of verbal intelligence, talent, learning skills, nervous systems, physical abilities or disabilities and a different family background. The teacher, in an interdisciplinary curriculum, takes account of these differences and is a guide, a mediator, and a resource person who helps bridge the gap between the outside world and the world of school.

TABLE 4

PROPOSED DIAGRAM FOR TEACHING SCIENCE AND ART AS INTER-DISCIPLINARY SUBJECTS

Table 4 concerns a possible way that science and art conepts could be interrelated without the subject losing a discrete identity.

For instance, science and art classes begin as separate subjects. Then once or twice a week, or whatever is deemed necessary by the students of a particular school, the two subjects meet as one class and discuss what each group has learned and how it relates to the other subject. Then hopefully this interaction of the two subjects will be carried out of the classroom and into the child's home and environment around him or her. After this initial phase has been completed, the students work on art and science projects using the knowledge they have gained in both areas to complete their work. At the end the art projects and science experiments are discussed by the group, which will lead to new possibilities in creating and experimenting in both areas. This final stage is the Pulling It All Together Stage. Everything that has been learned in science and/or art class is finally tied together.

TABLE 4

PROPOSED DIAGRAM FOR TEACHING SCIENCE AND ART AS INTER-DISCIPLINARY SUBJECTS

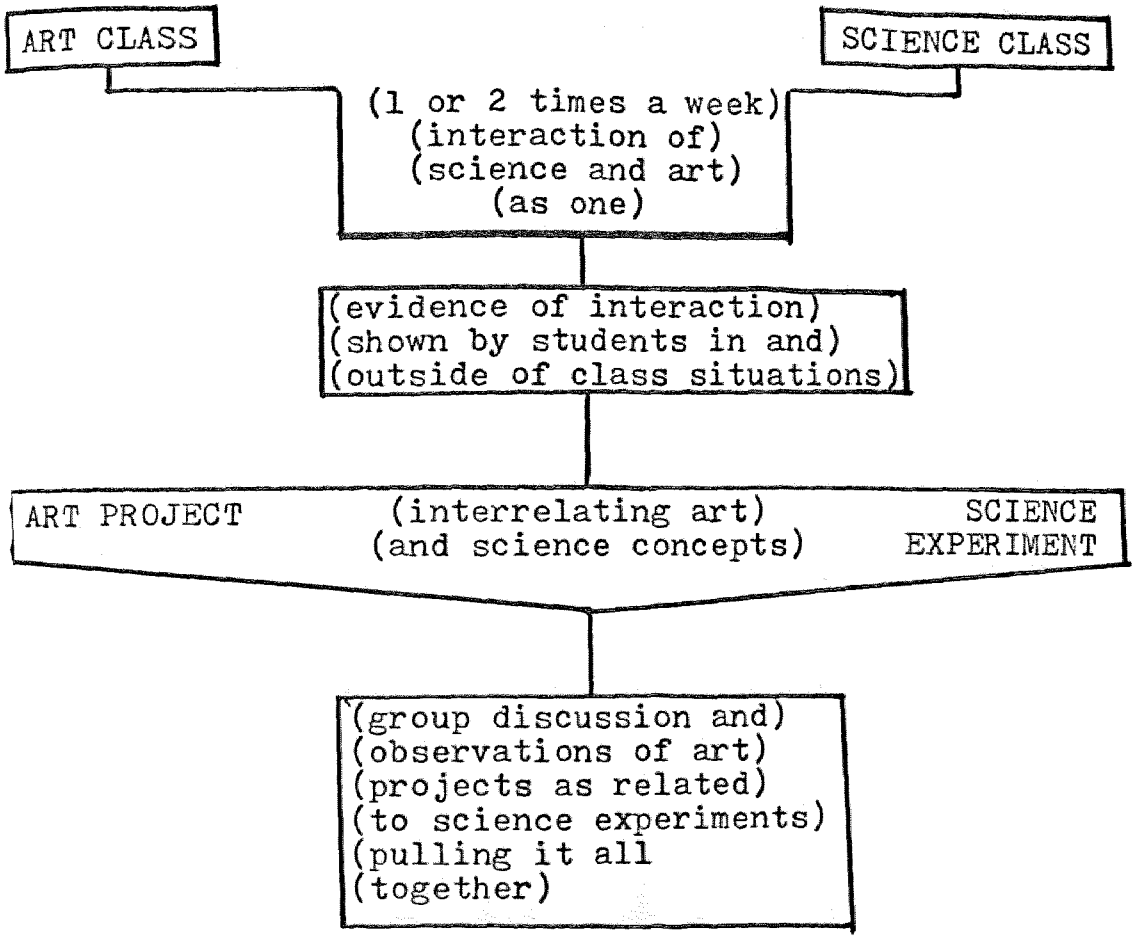

TABLE 5

INTERDISCIPLINARY APPROACH TO SCIENCE AND ART IN MOVEMENT

(Topic Area)

This particular design for interdisciplinary approaches to teaching school subjects is like two gears that mesh together. This diagram or model suggests ways in which science and art should be interrelated. For almost any science activity there is a corresponding art activity related to the topic area (or unit) of study. This is not to say that every science or art activity should be paralleled by an accompanying activity in the other area at all times. This could be used in developing lesson plans for science and art and at a glance one would see the relations and how to approach them. All the topic areas converge at the home and at the school so that the child will see a relationship of how the things are used not only in school situations, but also in life situations. It seems to the researcher that it is of the utmost importance that a child see the relationship of things he learns in school and how they apply to out of school situations or one's home environment. In order to be beneficial to the student, this practicability to life situations needs to be implemented, which may increase the motivation and interest the child has and in the end will better help him or her learn.

Table 5

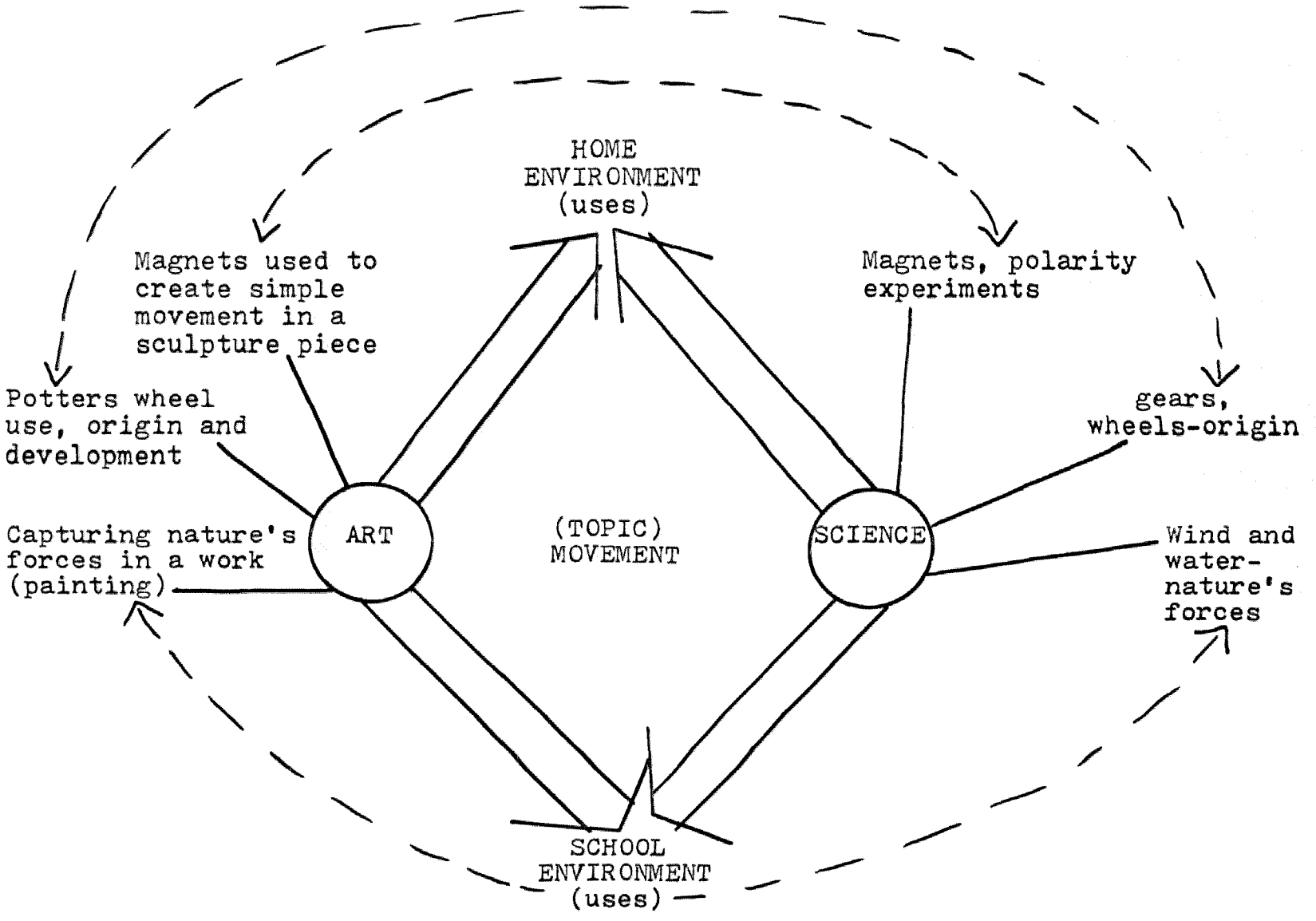
HOME
ENVIRONMENT
(uses)
Magnets used to create simple movement in a sculpture piece
Magnets, polarity experiments
Potters wheel use, origin and development
gears, wheels-origin
Capturing nature's forces in a work (painting)
ART
(TOPIC)
MOVEMENT
SCIENCE
Wind and water-nature's forces
SCHOOL
ENVIRONMENT
(uses)

Table 6

A simplified diagram of the CHILD'S LEARNING PROCESS as conceived of by the researcher, might be diagrammed as follows:

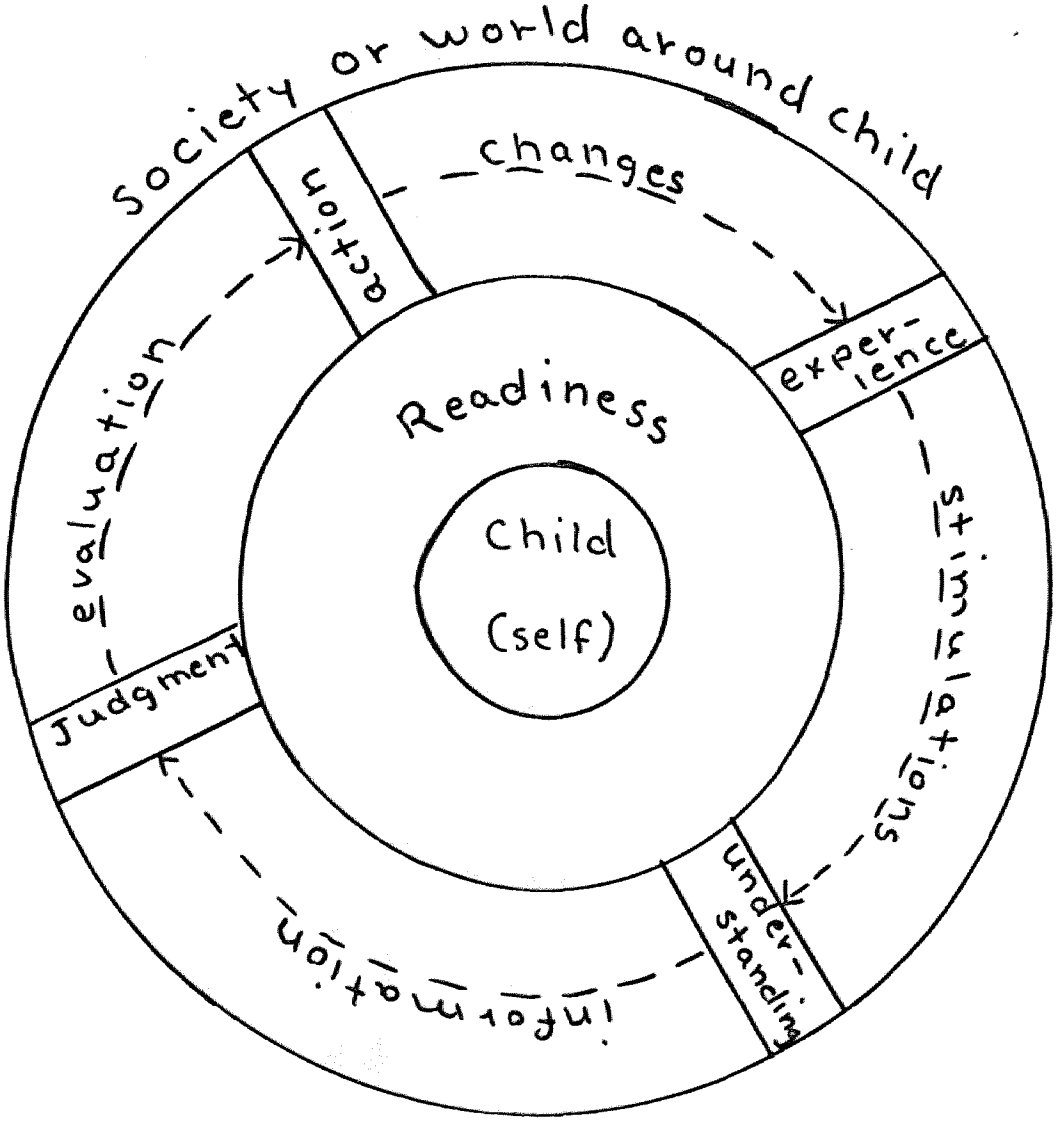

Table 6 on the previous page can be explained in this manner: A child needs to be ready or have the experience at hand before he is able to encounter the learning situation thoroughly. After he is ready, the child draws upon his environment for certain experiences and answers to certain phenomena. The environment is his stimulus to learn and thus he will want to acquire more skills in order to gain more experiences and information in the learning process. The whole trend is a circle of events which has no end, for life itself is a continuing series of learning experiences. It tends to be a two-way process--skills or knowledge from the world around the child, etc. are supplied to him or her and the child in return utilizes this knowledge or these skills to live and be useful in the world in which (s)he lives and works.

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First Grade Teacher from St. Joseph Elementary School in Cresco, Iowa, 1975.

Science Teacher from St. Joseph Elementary School in Cresco, Iowa, 1975.

Science Teacher from St. Theresa's Elementary School in Des Moines, Iowa, 1975.

Seventh Grade Teacher from St. Theresa's Elementary School in Des Moines, Iowa, 1975.

APPENDICES

APPENDIX A

ART QUESTIONNAIRE

School Code _____

DIRECTIONS FOR SAMPLING:

Please circle either EXCITING OK or DULL according to how you feel (personally) about each question. There are no right or wrong answers, this is just to see what your personal opinions are. You must answer all the questions for this to be valid. Do answer them carefully. Information will be kept secret, no names involved. Thank you very much for your help.

ART QUESTIONNAIRE:

1. Collecting and using things from nature	EXCITING	OK	DULL
2. Involving the use of shapes	EXCITING	OK	DULL
3. Experimenting	EXCITING	OK	DULL
4. Doing art outdoors	EXCITING	OK	DULL
5. Using past information to build ideas	EXCITING	OK	DULL
6. Looking at things around you	EXCITING	OK	DULL
7. Drawing by looking at people and animals	EXCITING	OK	DULL
8. Expressing one's ideas about a project	EXCITING	OK	DULL
9. Looking closely at objects	EXCITING	OK	DULL
10. Using ideas in constructing projects	EXCITING	OK	DULL
11. Involving man in the things around him	EXCITING	OK	DULL

ART QUESTIONNAIRE CONTINUED

12.	Showing others how to do things	EXCITING	OK	DULL
13.	Using things in nature	EXCITING	OK	DULL
14.	Being involved in looking, listening, speaking and doing in a project	EXCITING	OK	DULL
15.	Using classification by size, shape, color, weight, etc.	EXCITING	OK	DULL
16.	Exploring with seeing, hearing, touching, tasting and speaking	EXCITING	OK	DULL
17.	Being able to guess about things that may happen	EXCITING	OK	DULL
18.	Working with objects that move	EXCITING	OK	DULL
19.	Collecting materials and information	EXCITING	OK	DULL
20.	Using different places to develop art projects	EXCITING	OK	DULL

OBSERVATIONS:

SCIENCE QUESTIONNAIRE

School Code _____

Please fill in the INFORMATION BELOW CAREFULLY:

_____Teacher

_____Student _____Grade _____Boy _____Girl

_____Number of children in family

FOR SENIORS ONLY:

_____Have you taken an art course in school?

_____Have you taken a science course in school?

DIRECTIONS FOR SAMPLING:

Please circle either EXCITING OK or DULL according to how you feel (Personally) about each question. There are no right or wrong answers, this is just to see what your personal opinions are. You must answer all the questions for this is to be valid. Do answer them carefully. Information will be kept secret and no names involved. Thank you very much for your help.

SCIENCE QUESTIONNAIRE

1.	Doing science outdoors	EXCITING	OK	DULL
2.	Exploring things from nature	EXCITING	OK	DULL
3.	Using objects that move in experiments	EXCITING	OK	DULL
4.	Doing experiments	EXCITING	OK	DULL
5.	Collecting things	EXCITING	OK	DULL
6.	Using our eyes, ears, voice, nose and taste	EXCITING	OK	DULL
7.	Watching things around you	EXCITING	OK	DULL

SCIENCE QUESTIONNAIRE CONTINUED

8.	Learning about shapes	EXCITING	OK	DULL
9.	Classifying items into size, shape, color, weight, etc.	EXCITING	OK	DULL
10.	Studying and working with things from the past	EXCITING	OK	DULL
11.	Collecting and using materials from the earth	EXCITING	OK	DULL
12.	Studying about people and animals	EXCITING	OK	DULL
13.	Looking, listening, speaking and doing experiments	EXCITING	OK	DULL
14.	Developing ideas by constructing things	EXCITING	OK	DULL
15.	Telling about your discoveries	EXCITING	OK	DULL
16.	Using different places to experiment	EXCITING	OK	DULL
17.	Being able to guess what could happen	EXCITING	OK	DULL
18.	Involving man and his environment	EXCITING	OK	DULL
19.	Demonstrating about things you find	EXCITING	OK	DULL
20.	Examining objects closely	EXCITING	OK	DULL

OBSERVATIONS

APPENDIX B

ARTS IMPACT EVAULATION

Impact Program:

Conducted during 1973-74 School Year
by

Department of Evaluation, Research, & Planning
Columbus (Ohio) City School District
Evaluator: Robert J. Rodosky

METHODOLOGY: The purpose of the evaluation was to identify successes and failures of the program and to identify probable causes for them. This was done by:

1) Examining Reading and Math Achievement scores from City-wide Testing.
2) Surveying 10% of the parents, to determine parent perception of:

   a.) the importance of subject areas
   b.) child's progress in subjects
   c.) child's attitude to subjects

3) Interviewing 30% of the classroom teachers and 50% of the team teachers.
4) Administering a "School Climate" instrument to all classroom teachers in Arts IMPACT schools and a sample non IMPACT schools.
5) Examining the CEA Building Environment Survey Arts IMPACT schools and comparing the results with city-wide averages.
6) Administering the Children's Embedded Figures Test to a sample of IMPACT students at Cranbrook and Eastgate and a sample of students at a control school.

FINDINGS:

1) The IMPACT program is a solid educational idea that, when working properly, provides the students with many learning opportunities. The program working properly is contingent upon

   a.) supportive and flexible building administrative leadership
   b.) instructional leadership provided by the resource team, and

FINDINGS: (cont'd.)

c.) school size. (Smaller schools appear to have more success).

2) IMPACT has an effect on reading and math achievement. A decline in achievement normally occurs during the first two years of the program. However, by year three, achievement in a successful IMPACT school should have "bottomed out" and be improving. In all the IMPACT schools considered successful these results were obtained:

3) Successful IMPACT schools have a positive school climate.

4) SES is not an important success factor for IMPACT schools. In other words, successful IMPACT schools span all SES levels.

5) In less successful IMPACT schools, there is a feeling among classroom teachers that either (a) the student population of the school is changing in regard to SES, and/or (b) their students cannot learn basic skills by the IMPACT process.

6) Classroom teachers want to use the resource team members as "specialists".

7) Some processes of the program need improvement:

   a.) the inservice for classroom teachers at the 10 expansion schools was "too little and too poor".
   b.) facilities (mainly classroom space) are needed at certain schools.
   c.) more resource help from downtown. Dance and drama has no identifiable person downtown, and the music and art people are spread so thin that there is a minimum of help.

8) The parent survey indicates that parents:

   a.) are very supportive of the program
   b.) perceive that IMPACT is helping to improve reading interest and ability. Achievement data seems to support their perception.
   c.) indicate that IMPACT students participate in a wider variety of activities after school.

FINDINGS: (cont'd.)

9) The IMPACT program appears to have a positive effect on at least one problem solving behavior--one that requires isolating an essential element from the contest.

IMPACT is a process of Generating Positive Attitudes Toward Learning. It involves the quality of living, of human interaction, which goes on in schools. The core of the IMPACT process is an aesthetic one. It focuses on the arts, dance, drama, literature, music and visual art as facilitators of growth and learning in all areas of both students and teachers. This focusing on the arts is based on the premise that, although man has consistently reached some of his highest levels of achievement in and through the arts, the arts provide an area of learning wherein:

-----There are no right or wrong answers and, therefore, drill teaching and rote learning to achieve the right answers (with the attendant competition to learn the fastest and the most) are not essential.

-----Competition is with one's self and everyone can experience the joy which accompanies success.

_____Self respect and respect for others are nurtured.

Hopefully this consistent involvement in and with the arts will:

-----Provide an appealing, human environment for learning, a place where people want to be.

-----Stimulate students and teachers to approach all learning experiences with a mutual respect for each other and with the expectation that the experience will be pleasant and meaningful.

APPENDIX C

GRAPH 2

FREQUENCY COUNT--SCIENCE

SCORE	No. People With That Score	Per Cent	
23	1	.4	**
24	1	.4	**
29	2	.7	****
30	4	1.5	********
31	7	2.6	**********
32	1	.4	**
33	3	1.1	******
34	8	3.0	**********
35	5	1.9	**********
36	9	3.3	**********
37	10	3.7	**********
38	14	5.2	**********
39	11	4.1	**********
40	17	6.3	**********
41	18	6.7	**********
42	10	3.7	**********
43	17	6.3	**********
44	19	7.0	**********
45	17	6.3	**********
46	16	6.9	**********
47	8	3.0	**********

FREQUENCY COUNT--SCIENCE (CONT'D)

SCORE	No. People With That Score	Per Cent	
48	15	5.6	**********
49	8	3.0	**********
50	10	3.7	**********
51	9	3.3	**********
52	6	2.2	**********
53	4	1.5	********
54	4	1.5	********
55	3	1.1	******
56	5	1.9	**********
57	2	.7	****
59	1	.4	**
60	5	1.9	**********

MEAN: 43.281

MODE: 44.000

MEDIAN: 43.324

NUMBER OF OBSERVATIONS: 270

GRAPH 3

FREQUENCY COUNT--ART

SCORE	No. People With That Score	Per Cent
0	2	.7 ----
18	1	.4 --
22	1	.4 --
24	2	.7 ----
26	2	.7 ----
28	2	.7 ----
29	4	1.5 --------
30	4	1.5 --------
31	1	.4 --
32	2	.7 ----
33	4	1.5 --------
34	7	2.6 ----------
35	11	4.1 ----------
36	5	1.9 ----------
37	10	3.7 ----------
38	14	5.2 ----------
39	12	4.4 ----------
40	16	5.9 ----------
41	12	4.4 ----------
42	11	4.1 ----------

FREQUENCY COUNT--ART (CONT'D)

SCORE	No. People With That Score	Per Cent
43	17	6.3 ----------
44	23	8.5 ----------
45	9	3.3 ----------
46	12	4.4 ----------
47	12	4.4 ----------
48	6	2.2 ----------
49	16	5.9 ----------
50	7	2.6 ----------
51	7	2.6 ----------
52	10	3.7 ----------
53	8	3.0 ----------
54	6	2.2 ----------
55	1	.4 --
57	3	1.1 ------
59	1	.4 --
60	9	3.3 ----------

MEAN: 42.822

MODE: 44.000

MEDIAN: 43.206

NUMBER OF OBSERVATIONS: 270

Graph 4

FREQUENCY COUNT

ART-SCIENCE DIFFERENCE

SCORE	No. People With That Score	Per Cent	
0	23	8.5	##
1	38	14.1	##
2	43	15.9	##
3	33	12.2	##
4	29	10.7	##
5	23	8.5	##
6	19	7.0	##
7	21	7.8	##
8	11	4.1	##
9	6	2.2	##
10	9	3.3	##
11	9	3.3	##
12	4	1.5	##

FREQUENCY COUNT

ART-SCIENCE DIFFERENCE (CONT'D)

SCORE	No. People With That Score	Per Cent
29	1	.4 ##
40	1	.4 ##

MEAN: 4.311
MODE: 2.000
MEDIAN: 3.439
NUMBER OF OBSERVATIONS: 270